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ABSTRACT

Traditionally, group research has focused on outcome rather than process. In order to provide an efficient means of data collection and analysis in group process, the Automatic Vocal Transaction Analyzer (AVTA) system was developed to generate an objective chronography of conversation vocalizations, pauses, turntaking, switching, and interruptions. In order to investigate the group process using the AVTA, 100 undergraduates were divided into 20 five-member groups to discuss the "Desert Survival Problem," ranking the importance of 15 items to survival. Each group member's voice was individually recorded on one of five microphones that fed into a microcomputer system which monitored the on-off patterning of speech and silence for each person. After the discussions, subjects completed a questionnaire rating other group members and the group itself. Subsequently, the "grouptalk" parameters according to the AVTA were related to the individual ratings. An analysis of the results showed that individuals who talked more were likely to be rated higher on leadership and task performance but not particularly higher on likeability. Groups with a high amount of talking were rated high on "group spirit" but not on task performance. (Author/BL)

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Grouptalk: An Investigation of Group Process

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Abstract

Twenty groups of five persons each discussed the "Desert Survival Problem." Each group member's voice was individually recorded on one of five microphones that fed into a microcomputer system, which monitored the on-off patterning of speech and silence for each person. These data were transformed into "Grouptalk" parameters representing the different conversational states that can occur in a group discussion (e.g., individual turn, simultaneous speech, group turn). These parameters were then related to subjects' questionnaire ratings of other group members and of the group itself. Results showed that individuals who talked more were likely to be rated higher on leadership and task performance but not particularly higher on likeability. Groups with a high amount of talking were rated high on "group spirit" but not on task performance.

Grouptalk: An Investigation of Group Process

A major criticism of group research has been that it focuses more upon outcome than process (McGrath & Kravitz, 1982). This emphasis may have come about because process is difficult to study. To hear the content of what people are saying, one must follow it very carefully. The content of a conversation can then be coded, or one can use an approach like that of Bales (1950; Bales & Cohen, 1974), and reduce the verbal activity to a relatively few underlying social- and task-oriented categories.

A more efficient means of data collection and analysis comes from the work of Jaffe and Feldstein (1970). Rather than listening to words or emotional tones, Jaffe and Feldstein focused upon the precise timing of vocalizations and pauses. They studied monologues and dialogues, but their approach might be extended to group conversations. The amount and timing of sound and silence could indicate whether conversation moves fast or slow, speakers are talkative or laconic, listeners are responsive or dull, and the overall interaction is smooth or clumsy.

Jaffe and Feldstein used the Automatic Vocal Transaction Analyzer (AVTA) system to generate an objective chronography of conversation. AVTA automatically detects and records the presence and absence of speech from each subject. It also eliminates the troublesome spillover of one person's voice into another person's microphone. AVTA examines the on-off state of each voice at each moment and reassembles these bits of information into psychologically more meaningful parameters.

The Jaffe and Feldstein model has six parameters. Turns are made up of the alternating vocalizations and pauses of the speaker who has the floor at any given time. A pause at the end of a turn is a switching pause, which is

followed by the beginning of the other speaker's turn. Simultaneous speech is speech by the person who does not have the turn: interruptive simultaneous speech leads to a change of turn, and noninterruptive simultaneous speech does not.

Conceptual Model -- "Grouptalk"

Our work extends the Jaffe and Feldstein model to groups. With more than two people involved, the notion of individual turns no longer covers all possibilities. In a dyad, one speaker's turn will always be followed by the other speaker's turn. In a group, however, a turn may end with several others speaking at once after the original speaker has fallen silent, in which case it does not seem reasonable to attribute the turn to any single person. We propose the notion of "group turn" to cover this state. A group turn begins the moment an individual turn-taker has fallen silent and two or more others are speaking together; the group turn ends the moment an individual is again speaking alone. Analogously to individual turns, group turns may contain group vocalizations and group pauses and end with group switching pauses; during a group turn no one will ever be speaking alone. The "grouptalk" model, including individual turns and group turns, is shown in Figure 1.

The left side of Figure 1 is essentially the Jaffe and Feldstein model, with conversation always within the turn of an individual subject. Conversation involves vocalizations, pauses, and switching pauses, and, when a partner joins in, the two kinds of simultaneous speech. Our only difference with Jaffe and Feldstein is that more than one partner may join in during simultaneous speech. The right side of the figure covers group turns, when the floor cannot be attributed to any single person. Conversation moves back and forth along several paths between individual turns and group turns.

Data Acquisition System

Data acquisition is handled by a microcomputer system called "Group AVTA" (Dabbs & Swiedler, 1983). Subjects in a group of eight or less wear small lavalier microphones. An electronic device compares each microphone signal to a standard "trigger" level, corresponding approximately to the level of a soft voice. Signals rising above the trigger level are amplified to 5 volts and sent to an Apple II computer. These signals tell which microphones are active at a given moment, but further processing is needed to determine which subjects are active; that is, to determine whether a sound on a given microphone comes from the person wearing the microphone or from someone else.

The relative intensity of the microphone signals reveals who is speaking. Each speaker's voice will be louder, and thus above the trigger level more often on his or her own microphone than on any of the other microphones. The computer checks each microphone about eight times per millisecond. Every 10 milliseconds, the computer determines which microphone has been above the trigger level most often and designates this microphone as belonging to the true speaker. The computer fills in brief (300 millisecond) pauses within and between the speaker's words.

This handles a subject speaking alone, but the situation is more complicated when several speak together. The key to the solution is that when people speak together, their voices are not synchronized. There is a continuous mix of syllables, accents, and pauses, and even a soft-spoken speaker will have moments of being loudest in the group. The computer still picks the most active microphone every 10 milliseconds. When it finds rapid alternation among several microphones in which is most active, it "looks over" its array of data and designates all of the rapidly alternating microphones as belonging to active speakers. The procedure that filled pauses in the speech

of a single person will now fill gaps caused by the computer's alternation among the microphones of the several simultaneous speakers.

Method

Twenty groups composed of five undergraduates each spent 10-30 minutes working on the Desert Survival Problem (Lafferty & Pond, 1974). In solving this problem, subjects discuss and rank the importance of 15 different items (e.g., flashlight, overcoat, parachute) that might be present following a plane crash in the desert. During the discussion subjects wore microphones connected to the microcomputer, and after the discussion they completed questionnaires on which they rated each of their partners and the group as a whole.

Results

Data Reduction

Questionnaires. Among the questionnaire items were six seven-point bipolar adjective scales for rating the group as a whole and six scales for rating each member of the group. Ratings of the group included two items each on likeability of the group, quality of group performance, and group spirit. For describing each group, responses of the five members were combined into mean ratings of group likeability, performance, and spirit. Ratings of individual members included two items each on leadership, task performance, and likeability of each partner. For describing each group member, responses made by the four partners were combined into mean peer ratings of leadership, task performance, and likeability.

Voice. The on-off states of each voice, recorded each quarter second, were transferred from the Apple computer to a Univac 90/80 computer, where a program called GRPTFD transformed the data into codes defining the Grouptalk model. The resulting Grouptalk codes for each quarter second were then stored

in time frame data file format (Bakeman, 1975). A program called DFREQ examined these data and computed percent of time, number of occurrences, and mean duration of each occurrence of each Grouptalk code. DFREQ summaries were used as input into SPSS statistical programs for further analysis.

Peer Ratings

We wished first to see how an individual's vocal behavior was related to his or her leadership, task performance, and likeability. In order to accomplish this, we correlated partners' mean ratings of subjects with subjects' scores on the Grouptalk parameters. We used overall correlations based upon 100 subjects, rather than pooled within-group correlations, because we felt that eliminating group mean differences would unnecessarily attentuate the individual differences in speech and partner ratings.

Initial examination of the correlations revealed a pervasive positive relationship: talking is good. Amount of talking was related to most of the Grouptalk parameters, and this pattern tended to obscure differences among the relationships between these parameters and the peer ratings. We therefore computed partial correlations that controlled for amount of talking in the relationship between other Grouptalk parameters and peer ratings. The correlations are summarized in Table 1.

Several patterns are apparent. Leadership and task performance correlate more strongly with talking than likeability does, though all three of the correlations are significant. Grouptalk variables contribute something over and above a simple measure of talking, as indicated by the significant partial correlations. For leadership and task performance, it is best to spend time vocalizing and pausing in one's own turns, and not in emitting simultaneous speech during other's turns. For likeability, it is best to talk during group turns.

Ratings of Groups

The Grouptalk model allows us to go beyond individuals and study emergent qualities of groups. Group turns are produced by group members but not attributed to any particular individual. It seemed likely to us that subjects' evaluations of a group would be related to how much the members participated and to how often several of them participated at once.

The percent of time groups spent in each of the Grouptalk states were correlated with mean members' ratings of group likeability, performance, and spirit. These correlations are shown in Table 2. With groups, unlike with individuals, total talking was not consistently correlated with grouptalk parameters, and total talking was not partialed out of any of the relationships shown in the table.

The pattern of findings is different than it was for individuals. Group spirit is positively related both to vocalization within individual turns and to simultaneous speech and group vocalization, and it is negatively related to pausing. Group performance is virtually unrelated to the Grouptalk parameters. A general impression from the table is that group likeability is intermediate between group spirit and task performance in its relationship to the Grouptalk parameters.

Discussion

The microcomputer efficiently processed a large amount of data, and the Grouptalk model organized these data in a meaningful and comprehensive manner. The familiar finding that leadership and talking are correlated (e.g., Sorrentino & Boutillier, 1975) was made with more precision than in previous studies, and we found that beyond the simple amount of talking there were significant differences among the Grouptalk codes.

The findings differed for individuals and groups. For individuals, talking was associated more with ratings of leadership and performance than likeability. For groups, talking was associated with spirit or enthusiasm and not at all with performance. The finding is paradoxical and it provides a dilemma for group leaders. Group members enjoy a lot of talking, but they do not especially enjoy the person who talks the most!

We are continuing to analyze the data, focusing upon patterns of turn taking. Turns can be attributed to the five members or to the group as a whole, and a six by six transitional matrix will summarize the probability of each party following each other party. Jaffe, Cassota, and Feldstein (1964) described dyadic conversation as a Markov process, and we are looking now to see whether turn taking in groups also approximates a Markov process.

We will also examine the order in turn taking using the information statistics "H" and "T". High disorder, indicating that any member is equally likely to follow any other, has egalitarian connotations. We suspect that with such high disorder no one will be clearly identified as leader but (especially if overall talking is also high) satisfaction with the group will be high. More order, or stereotypy, in the pattern of turn taking might appear either where there is a leader or where overall group discussion has broken down into dyads and triads.

Finally, we are using the present approach to examine the relationship between vocalization and idea production in brainstorming groups. Initial indications are that it is high levels of pausing, rather than high levels of talking, that lead to the production of ideas.

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Table 1. Individuals: vocal activity and peers' ratings of leadership, task performance, and likeability. N = 100.

Grouptalk Code	Mean % of session	Correlations with: Leader-ship	Task Perform.	Like-ability
Talk (vocalization and simultaneous speech)	16.3	.74**	.66**	.35**
Turn	19.2	.34**	.29**	.04
Vocalization	12.1	.23*	.20*	.00
Pause	3.2	.21*	.18*	-.06
Switching pause	3.9	.42**	.37**	.18
Non-interrupt. simul. speech	1.7	-.21*	-.18	.02
Interrupt. simul. speech	1.0	-.18	-.17	.03
Group simul. speech (during group turns)	1.4	-.24**	-.20*	-.03

*$p < .05$

**$p < .01$

Note.--First line shows Pearson r's of ratings with Talk. Remaining lines show partial r's in which the simple effect of Talk has been removed.

Table 2. Groups: overall vocal activity and members' ratings of likeability, performance, and spirit. N = 20.

Grouptalk Code	Mean % of session	Correlations with: Like-ability	Perform.-ance	Spirit
Talk	63.7	.31	-.10	.58**
Individual Turn	96.0	-.28	.18	-.35
Vocalization	60.6	.29	-.05	.52*
Pause	15.9	-.48*	-.09	-.62**
Switching Pause	19.5	-.12	.17	-.32
Noninterrupt. simul. speech	5.6	.41	-.06	.70**
Interrupt. simul. speech	3.7	.37	-.18	.59**
Group Turn	4.0	.28	-.15	.35
Group Vocalization	3.1	.27	-.27	.58**
Group pause	1	.03	-.41	.11
Group switching pause	.9	.12	.11	-.24

*$p < .05$

**$p < .01$

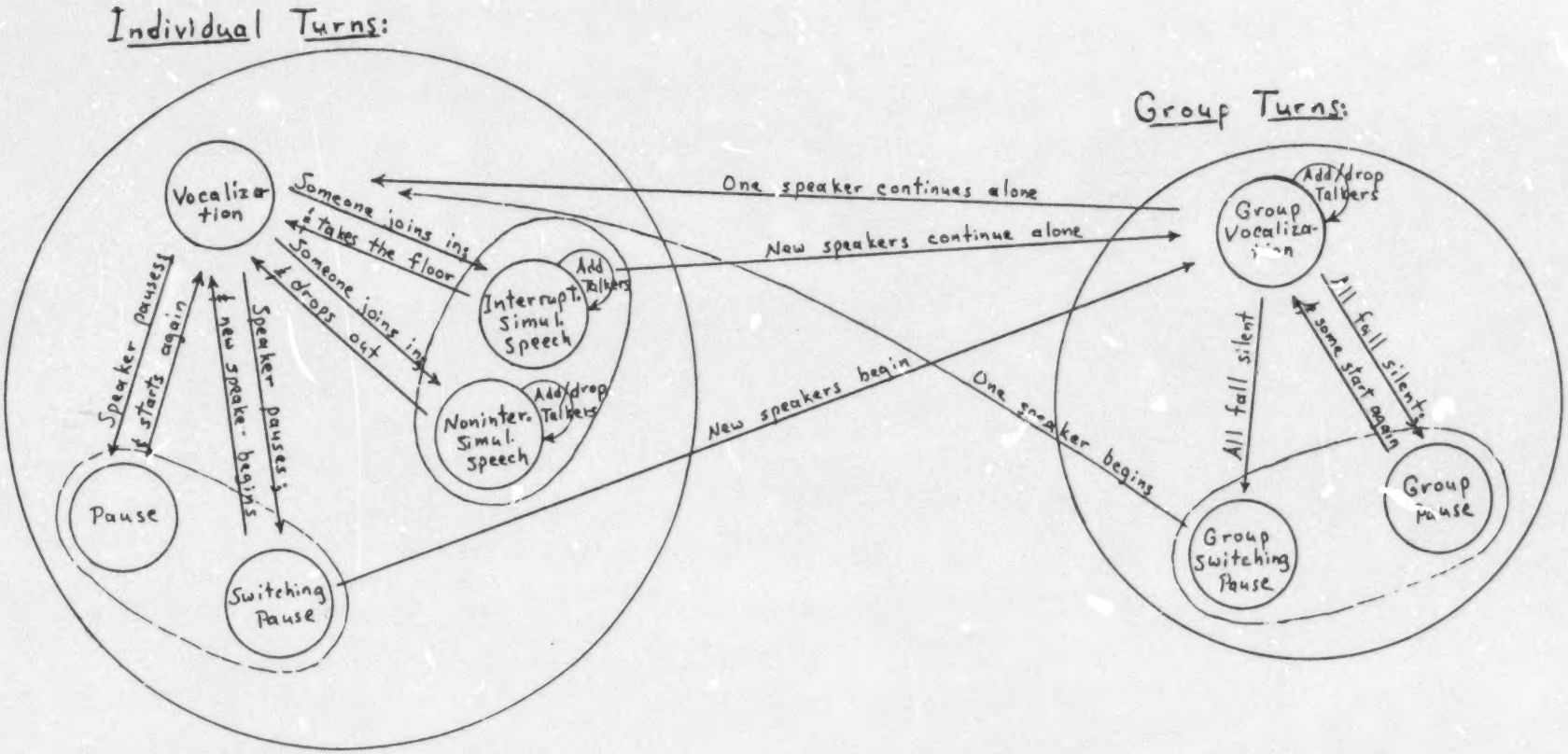

Figure 1. The "Grouptalk" Model.